23. White Collar Mendelising in Hybrid Pheasants.

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(Text-figure 1.)

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Two or three years ago it occurred to me that an examination made of the relative numbers of dark-necked and ringed male pheasants shot in our coverts would provide some interesting material wherein to trace the working of Mendel's law. The dark-necked pheasant *Phasianus colchicus* had been the only inhabitant of Britain's forests and woods for centuries; the pheasant is mentioned in Saxon times in a "bill of fare drawn up by Harold for the Canons' households ..... A.D. 1059, and preserved in a manuscript of the date of circa 1177": (see Dawkins, 'Ibis,' 1869, p. 358). The first introduction of *Phasianus torquatus*, the so-called "ringed pheasant," to our woods was towards the latter end of the eighteenth century. This species has a white collar, broken or interrupted on the throat.

For two seasons a simple reckoning was made of the males shot, and the data collected are remarkable evidence of the continual Mendelising occurring in the collar of the hybrid pheasants of our coverts, absence being the recessive.

The grading was arranged as follows:—

Collar absent.	Dark-necked *Phasianus colchicus* type.
Few tips.	From two or three to a dozen feathers with very narrow white margin, found beneath ear-coverts.
Half collar.	Collar arrested beneath the ear-coverts.
Three-quarters collar.	*Phasianus torquatus* type, collar broken at throat.
Complete ring.	Hybrid mutation collar making a complete circle round the throat.

The dark-necked male pheasant *P. colchicus* has the whole neck green lustre.

The hybrid (*P. colchicus* × *P. torquatus*) male pheasant has the green lustre on neck above the collar, but a rich bronzed copper beneath the collar. The "complete ring" differs in individuals—it is sometimes broad, sometimes slender, sometimes medium.

Shooting Season 1912–1913.

Number of males examined—294.

Collar absent.	Few tips.	Half collar.	Three-quarters collar.	Complete ring.
26	47	10	175	36

Shooting Season 1913–1914.

(Christmas shoot omitted.)

Number of males examined—244.

Collar absent.	Few tips.	Half collar.	Three-quarters collar.	Complete ring.
15	47	52	118	12

Total number of male pheasants examined—538.

Collar absent.	Few tips.	Half collar.	Three-quarters collar.	Complete ring.
41	94	62	293	48

making 449 variations of broken collar and the numbers for the recessive "collar absent" (dark-necked pheasant) and those for the "complete ring" nearly equal, suggesting that the latter may be a "mutation recessive."

Further evidence of the Mendelising of the white collar, collar dominant, dark neck recessive, was found in a cross made in captivity in my pheasantry between *P. versicolor*, collar absent, and *P. formosanus*, collar present, where, though the numbers are necessarily small, the same graded forms occur. The reciprocal cross made in 1914 gave the same result.

Desiring to ascertain whether a complete ringed pheasant had ever been shot in a wild state, I sought information from several persons, all of whom have been most kind in replying to my inquiries.

Mr. W. R. Ogilvie-Grant, Assistant Keeper of Zoology in the Natural History Museum, states that all the *Phasianus torquatus* group have the white collar interrupted at the throat, but that males from Northern China—*Phasianus kiangsuensis* and *Phasianus pallasi*—have the collar interrupted on the nape and widest on the throat. I am not aware that any *P. torquatus* of this form has ever been introduced into Britain.

Mr. J. H. Miller (of the Miller-Carruthers Expedition to Central Asia) stated that he could not be absolutely certain, but was under the impression that he had never seen a complete ring on any of the male pheasants he shot of the variety of the *torquatus* group named *P. mongolicus* (a pheasant frequently introduced into English coverts). Mr. Miller generously presented me with a beautiful specimen which he had shot in the

Tekkes Valley, Ili, alt. 3000 ft. This bird has the white three-quarters collar broken at the throat, and also the major, median, and minor wing-coverts of isabelline-white. This isabelline-white wing-patch has not been observed on any of the male common wood-pheasants examined from 1912 to 1914, but it is quite possible that its occurrence amongst our hybrids may have been noticed by others.

The major, median, and minor wing-coverts in *P. formosanus*—a variety of *torquatus* also often introduced into our coverts—are pale grey, and this colour was frequently found amongst the hybrid males examined.

Mr. Douglas Carruthers, who is now bringing out a work on the fauna of North-west Mongolia and the Dzungaria, replied to my inquiry as follows:—"I do not recollect ever collecting a wild pheasant with a complete ring, nor do I believe that there are any. Badly made up skins can often give the idea of a ring joining up the front, for the white feathers can be pulled round so as to meet. The rings *varied* in breadth and whiteness, but none formed the complete circle."

It thus seemed fairly established, from the specimens in the Natural History Museum and the observations of these two experienced travellers, that a pheasant with a complete ring in the wild state had not been recorded.

Mr. Fenwick-Owen, however, supplied me with an interesting series of observations on a new variety of pheasant he shot in 1912 in the Chone district of the province of Kansu, on the Peling Mountains. This pheasant was classified as a new form of the *P. torquatus* group by Mr. Ogilvie-Grant and named *Phasianus stranchi chonensis*.

Mr. Fenwick-Owen also shot *P. elegans*, a dark-necked (collar absent) pheasant in the Chone district; and in the neighbouring province of Sechuan, Prejevalsky, a Russian, first found a three-quarters ring-necked pheasant named *P. sechuanensis*. The habitats of *P. elegans* and *P. sechuanensis* overlap.

In a letter to Fenwick-Owen dated November 18th, 1912, Ogilvie-Grant remarks on certain resemblances in *P. stranchi chonensis* to both *P. sechuanensis* and *P. elegans*.

In Mr. Fenwick-Owen's words:—"In *P. stranchi chonensis* the ring varies from the faintest suspicion of a ring to the complete full ring. Occasionally there is no sign of a ring at all."

These remarks suggest that a hybrid segregation similar to that found in our own coverts is taking place in a wild state—that, in fact, his new pheasant may be the result of a cross between the "dark-necked," collar absent, *P. elegans* and the "ring-necked," collar present, *P. sechuanensis*, whose habitats overlap.

The following short descriptions of characters found in *P. elegans* resembling *P. colchicus*, and of characters found in *P. sechuanensis* resembling *P. formosanus*, the form of *torquatus* peculiar to the island of Formosa, made from a brief inspection of these species

at the Natural History Museum with the males and females of all four laid side by side, afford some ground for the hypothesis.

Male. *P. elegans*, dark neck, collar absent, coloration much resembles male *P. colchicus*.

Female. *P. elegans*, *dark bird*, breast *patterned* like female *P. colchicus*.

Male. *P. sechuanensis*.
- Crest identical with male *P. formosanus*.
- Wing *secondaries* pattern identical with male *P. formosanus*.
- Collar three-quarters interrupted at throat, widest at the ends like male Formosan, but the ends are square instead of a vandyke-point like the male *P. formosanus*.
- Flank-feathers differ, being a bronze-copper instead of pale cream as those of the male *P. formosanus*.

Female. *P. sechuanensis*.
- *Light bird*, breast *unpatterned*; strongly resembles *P. formosanus* female.
- Tail—lateral rectrices—identical with female *P. formosanus*.
- Wing—secondaries—identical with female *P. formosanus*.

From the above comparison it might be inferred that a hybrid from a cross between *P. elegans* and *P. sechuanensis* would give the same collar segregation as the hybrid between *P. colchicus* and *P. torquatus* in our woods. Fenwick-Owen's observations on the collar variations in his new pheasant *P. stranchi chonensis* would appear to be at least very suggestive of the hybrid origin of the bird.

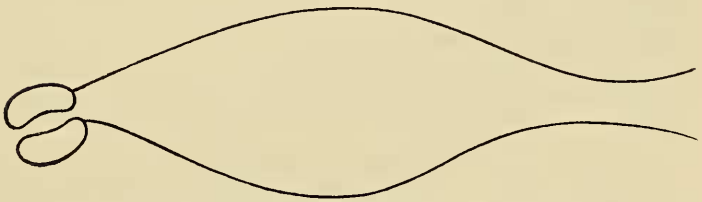
Mosaic of male and female Secondary Sexual Characters in Common Pheasant.

I would now draw attention to a remarkable specimen of the common male pheasant (of which a detailed description will be found at the end of this paper) with a curious mosaic of male and female plumage in transverse section. Colour and pattern are coupled in every case, and where the male and female plumage also differ in structure (the male degenerate, the female normal, as on the posterior back feathers and the tail-coverts) we find all three factors correlated. The bird was a young male bred in May 1913, so there is no question of age having produced the phenomenon. A male *P. formosanus* had been used for three years previously in the breeding-season in the pheasant pen. From experiments in my own pheasantry I infer that this extraordinary bird was a hybrid, which, had it not unfortunately been shot, would have proved sterile, although the testes, on dissection,

were normal in size and healthy in appearance, and no trace of an ovary could be discovered. The dissection was witnessed and examined by two people. During some twelve or thirteen pheasant rearing-seasons within my own experience, from one to two so-called "mules" appear in every thousand birds reared. An old keeper in our employ makes the same statement from a life experience. These "mules," on dissection, have generally been females. The bird exhibited is only the second male mule I have ever met with.

In the 'Journal of Genetics,' vol. iii. p. 205, Mr. C. J. Bond describes and illustrates an example of hemilateral development of secondary sexual male character in a hermaphrodite *P. formosanus*. He is inclined to attribute the peculiar divisions of male and female pattern to male hormonic activity in an atrophied female sex-gland, patches of male element in active growth in a degenerating ovary; but in the example before us the mosaic of male and female colour and pattern is *transversely* segmental, also

Text-figure 1



Sexual organ of mosaic male common Pheasant, seven months old. Length 4 inches, without reckoning the curve: testes 7/16 inch.

dissection only revealed a male organ of healthy normal appearance. A paragraph in a daily newspaper, July 1914, refers to some abnormal pheasant skins on exhibition at the Royal College of Surgeons, in which one specimen is noted of a male having some feathers of female type.

Male Common Pheasant.

A mosaic of male and female plumage.

Shot 17th January, 1914.—Moyles Court.

First skinned, then dissected*. The plumage was compared with a dark-necked common male and a common female *P. colchicus*, also shot in the woods. It was observed that pattern, colour, and structure are linked.

* Ernest Adlem, the keeper, witnessed the dissection, and a drawing to scale was made of the male organ, a rule with sixteenth divisions being used for measurement. No trace of a female organ was seen.

Crest: Common male pheasant, feathers paler, amongst them some feathers, mosaics of male and female.

Neck: (Collar, form of male *P. formosanus*, Formosa variety of *P. torquatus*.)

Interscapulars: Common male pheasant, but *duller* in colour.

Scapulars: Some common female pheasant: some mosaics of male and female.

Back: Mosaics of common male and female.

Tail-coverts: Pattern, colour, and structure, mosaics of common male and female.

Tail: Centrals and Laterals. All mosaics in transverse sections of common male and female colour and pattern.

One extra quill-feather on each side, a small straight quill, making 20 instead of 18 feathers.

Throat: Common male.

Breast: A few common female, unpatterned fawn.
Many common male, colour less brilliant.
Some mosaics of both male and female.

Flank: Common male; some common female; some mosaics of both.

Thigh-tuft: Common male.

Wing: Primaries; common female.
Secondaries; common female.

Wing-coverts: Major; common male.
Median; mosaics, colour and pattern, of male and female.
Minor; some common female.
some mosaics, colour and pattern, of common male and female.